



Bodies of evidence: The ‘Excited Delirium Syndrome’ and the epistemology of cause-of-death inquiry

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ARTICLE INFO

Keywords:

Forensic medicine
Excited delirium syndrome
Evidence
Causation
Underdetermination
Medicalization
Police violence

ABSTRACT

“Excited Delirium Syndrome” (ExDS) is a controversial diagnosis. The supposed syndrome is sometimes considered to be a potential cause of death. However, it has been argued that its sole purpose is to cover up excessive police violence because it is mainly used to explain deaths of individuals in custody. In this paper, we examine the epistemic conditions giving rise to the controversial diagnosis by discussing the relation between causal hypotheses, evidence, and data in forensic medicine. We argue that the practitioners’ social context affects causal inquiry through background assumptions that enter inquiry at multiple stages. This analysis serves to better understand the wide usage of the controversial diagnosis of ExDS.

When citing this paper, please use the full journal title *Studies in History and Philosophy of Science*.

1. Introduction

On December 23, 2020, two police officers responded to a call reporting that Angelo Quinto was hurting his mother.² After having separated Quinto and his mother, one officer placed one knee on Quinto’s shoulder, with his other knee on the floor. Quinto was handcuffed, lying on his stomach, and had another officer holding his legs. Moments later, two further officers arrived on the scene. One of the officers replaced the officer kneeling near Quinto’s shoulder. When paramedics arrived and rolled Quinto over, his face was purple in colour, there was blood on his face and the floor, and he was unresponsive. Quinto was transported to the hospital where attempts to save his life were unsuccessful. He was pronounced dead on December 26, 2020.

In the coroner’s inquest, the forensic pathologist testified that the cause of Quinto’s death was ‘Excited Delirium Syndrome’ (ExDS). The

manner of death was ruled to be accidental. The district attorney’s report concludes that there is no evidence of a criminal offence committed by the involved police officers. An autopsy conducted at the expense of Quinto’s family, however, identified restraint asphyxia as cause of death, implying that the police officers intervening in the Quinto home had contributed to the death. Angelo Quinto is only one of numerous individuals, often people of colour, whose deaths in or following police custody have been assigned to ExDS. ExDS is a problematic diagnosis, which has been hotly debated in both academic publications and the media. Lethal cases of assumed ExDS are particularly controversial because the mechanism of death in these cases is unknown.³

Given this problematic status, why is the diagnosis of ExDS employed at all? According to civil rights groups and investigative journalists, ExDS is a fake diagnosis that is used for acquitting officers who have used excessive force (Byju, 2021). Extant analyses such as the report by Physicians for Human Rights (da Silva Bhatia et al., 2022) specifically look at the institutional, political, and racist circumstances of the ExDS diagnosis.

Here we focus on the epistemic conditions enabling the use of the ExDS diagnosis. We highlight a tension between the purpose of forensic

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² The following account of the events surrounding Angelo Quinto’s death is based on the Contra Costa district attorney’s report of the Law Enforcement Involved Fatal Incident In-Custody Death of Angelo Voithugo Quinto on December 24, 2020 (Becton, 2022).

³ Mechanism of death refers to the specific physiological derangement in the body that results in death.

medicine and its evidentiary practices. More precisely, we identify three potentially problematic features of cause-of-death inquiry.⁴ First, cause-of-death hypotheses are often underdetermined by the available evidence. Second, among practitioners there is often disagreement about what comes to count as evidence in the first place. These issues in and of themselves need not be problematic. But in both instances background assumptions play a key role in enabling causal inference. The third issue we will highlight is that these background assumptions may be adversely affected by aspects of the social context of forensic medicine.

We argue that these three features are amplified in the case of ExDS. The first issue is amplified because in supposed cases of ExDS, there is no known causal mechanism. Therefore, the primary basis of causal inference is counterfactual reasoning. Moreover, such counterfactual reasoning is particularly problematic in supposed cases of ExDS because experimentally simulating the circumstances of death is difficult. The second issue is amplified because the evidence in supposed cases of ExDS is particularly elusive. The main competing cause of death in such instances is asphyxia, a condition that like ExDS is not always easy to discern postmortem. Third, in ExDS cases background assumptions are particularly prone to be affected by the social context because the defendants in such cases are often law enforcement.

A few caveats are in order. First, we should emphasise that we agree with the critics that the ExDS diagnosis does not track an independent pathophysiological phenomenon. Second, while we are interested in the epistemic conditions that have given rise to the large impact of the ExDS hypothesis, we do not aim here to provide further evidence against the hypothesis. Given the problematic character of the ExDS diagnosis, we hope that a better understanding of the epistemic conditions under which the diagnosis has been developed and is used will eventually help ameliorate the current situation. Third, our focus is on various forms of underdetermination. We believe there are also instances in which hypotheses are well determined by the evidence: cases where the evidence is unequivocal, but unduly dismissed by the experts in order to push an interpretation that is beneficial to the expert's client.

The paper is structured as follows. In section 2 we review extant characterizations of ExDS and examine two argumentative strategies that have been pursued by proponents of the ExDS diagnosis. In section 3 we address three features of forensic medicine that are particularly problematic in instances of supposed ExDS: underdetermination of hypotheses by evidence (3.1), what counts as evidence in the first place (3.2), and the impact of the social context on background assumptions (3.3). In section 4, we draw conclusions and provide an outlook for questions to be discussed in future work.

2. Excited delirium syndrome

ExDS is a highly problematic diagnosis that has been contested in both the scientific literature and the media. Most medical associations, including the American Psychiatric Association (APA) and the World Health Organization (WHO), do not consider ExDS to be a valid diagnosis (American Psychiatric Association, 2020). However, the American College of Emergency Physicians (ACEP) and the National Association of Medical Examiners accept ExDS as a real condition (McGuinness & Lipsedge, 2022; Mitchell et al., 2017). According to the ACEP, it is “a real syndrome of uncertain etiology” (ACEP Excited Delirium Task Force, 2009).

ExDS lacks clear diagnostic criteria, and no autopsy findings directly indicate ExDS. This means that the pathological alteration that would have resulted in death cannot be identified in such cases (ACEP Excited Delirium Task Force, 2009, 2; Pinheiro, 2006, p. 19). Attempts have been made to identify biomarkers that could be used for diagnosing ExDS. Most importantly, elevated heat shock protein (HSP70)

expression in the brain has been claimed to indicate ExDS (Mash et al., 2009). However, the validity of this finding has been questioned. Johnson et al. (2012, 4) suggest that the elevated HSP70 expression may be related to cocaine use “and/or interventions by medical and law enforcement personnel rather than the presence or absence of [ExDS] per se”. In other words, the presence of this biomarker could simply indicate that a struggle has happened.⁵

In the absence of tests and markers that could indicate ExDS, the diagnosis is based on clinical characteristics, reported pre-mortem behaviour and exclusion of alternative explanations for death (ACEP Excited Delirium Task Force, 2009, p. 10). The behavioural characteristics associated with ExDS include for example aggression, paranoia, agitation, “superhuman” strength, intolerance to pain, attraction to mirrors, elevated body temperature, and disregarding the commands from police or medical staff (Byard, 2018; Strömmer et al., 2020; Vilke et al., 2012).⁶ The typical presentation of the condition is in a male in his thirties, who is obese, and who has a history of drug use or psychiatric illness (Byard, 2018). A consequence of the lack of clear diagnostic criteria is that the estimates of the mortality rate of ExDS vary: According to Gonin et al. (2018), it is between 8,3% and 16,5%. However, in a recent review conducted by Strömmer et al. (2020), the mortality rate for individual cases reported in the literature was 62% and for aggregate studies 79%.

Here we are interested in claims about ExDS as a potential cause of death. Cause of death refers to “the disease or injury that initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury” (World Health Organization, 2022, sec. 0.4). For example, a cause of death can be strangulation, alcohol abuse, or lung cancer. The cause of death is to be distinguished from the manner of death, which refers to how the cause of death took place. The classifications of manner of death differ between countries. For instance, in the United States (U.S.) context the possibilities are natural, accident, suicide, homicide, and undetermined. It is worth noting that the manner of death can differ between cases even if the cause of death was the same: a gunshot wound can be the cause of death in cases of accident, suicide, and homicide (Pinheiro, 2006, p. 19).

An immediate problem that arises here is the syndrome status of ExDS. ‘Syndrome’ means a “running together or a concurrence” and has been described as a “category intermediate between a formally defined disease entity that has found a place in a textbook and an unclassified individual case” (King, 2016, p. 162). According to King, ‘syndrome’ does not necessarily mean that there is no underlying cause, but even in the cases where the cause is known, the often unclarified nature of syndromes leaves open whether it can itself be seen as a cause. However, this does not prevent practitioners from attributing deaths to ExDS. The status of ExDS as a potential cause of death is particularly controversial because the most common alternative cause-of-death candidates in cases of supposed ExDS are related to excessive police violence. Many commentators have argued that the ExDS diagnosis is a tool for covering up police wrongdoings (Ranson, 2012; Byju, 2021; da Silva Bhatia et al., 2022).⁷ Also the APA has stated that “[t]he concept of ‘excited delirium’ ... has been invoked in a number of cases to explain or justify injury or

⁵ See Binney's (2019) discussion of how trying to establish a set of diagnostic criteria by examining diseased and non-diseased individuals gives rise to Meno's paradox and the problem of nomic measurement, the problem of measuring an entity which is not directly observable (Chang, 2004).

⁶ As an anonymous reviewer pointed out, the case of diagnosing ExDS resembles the controversy over using the Psychopathy Checklist - Revised (PCL-R) to diagnose psychopathy. Diagnostic manuals do not include psychopathy as an independent disorder, yet PCL-R is used in penal systems. For a discussion, see Walters (2004).

⁷ ExDS has been invoked as a cause of deaths in police custody not only in the US, but also, for example, in Australia, the UK (Kurmelovs, 2021), and Spain (Martín-Ayuso et al., 2022).

⁴ This discussion is inspired by Longino's (1990) approach to evidence, data and background assumptions.

death to individuals in police custody, and [it] is disproportionately applied to Black men in police custody” (*American Psychiatric Association, 2020*). Most ExDS cases reported in literature have involved the presence of law enforcement officers, and the mortality rate in those cases is higher than in other cases, e.g., when paramedics are the only officials who have been present (*Strömmer et al., 2020*). In a review conducted by Gonin et al., ExDS was associated with 11.1%–12.5% of deaths in police custody (*Gonin et al., 2018*). Moreover, dying in a prone position (i.e. lying flat chest down) while being physically restrained is mentioned as a typical characteristic of an individual diagnosed with ExDS (*Gonin et al., 2018; Strömmer et al., 2020*).

Another important aspect is the racist background of the ExDS diagnosis. It is known that systemic racism is an important problem in police killings (*De Angelis, 2021*), such as in cases of shooting bias (*Leuschner & Fernandez Pinto, 2022*). But in cases of supposed ExDS the situation is likely even worse because already the behavioural characteristics used to diagnose ExDS involve stereotypes, such as the victim having “superhuman” strength. Consequently, being African-American is mentioned as a risk factor for ExDS (*Gonin et al., 2018*).

The discussion on ExDS has become more heated in recent years as cases of police violence have been reviewed. In what follows we will address two arguments that have been at the centre of these controversies. The main point of disagreement that we will address is whether ExDS is an independent pathophysiological phenomenon that can be seen as a cause of death or whether at least some of the deaths must be attributed to undue brutality.⁸

2.1. History of ExDS and the argument from precedent

An important argumentative strategy employed by proponents of the ExDS diagnosis is to point to supposed historical cases of ExDS serving as precedent. Those who take ExDS to be a real medical condition often argue that the first accounts come from the 19th century, when psychiatrist Luther Bell reported on asylum patients suffering from delirium and mania (e.g. *DiMaio & DiMaio, 2006*; see also *McGuinness & Lipsedge, 2022*). The so-called Bell’s mania was reported to have a 75% fatality rate (*Byard, 2018*). Even though the patients of Bell exhibited symptoms and behaviours similar to recently reported ExDS cases, such as disorientation and agitation, there are considerable differences between the historical and current cases. For example, in Bell’s mania cases the symptoms usually started weeks before death (*Kraines, 1934; McGuinness & Lipsedge, 2022*). Moreover, unlike in modern supposed ExDS cases, most individuals suffering from Bell’s mania were female (*Kraines, 1934, p. 34*).

The more recent history of the claimed condition begins in the 1980s. The term “Excited Delirium” originates from Charles Wetli and David Fishbain. In their article “Cocaine-Induced Psychosis and Sudden Death in Recreational Cocaine Users” (1985), Wetli, who then worked as a medical examiner in the Dade County coroner’s office, and Fishbain, a psychiatrist, reported on the sudden deaths of seven cocaine users in Florida. All of the deceased individuals had first presented hyperactivity, agitation and bizarre behaviour. They had been restrained, six of them by police. Of the individuals restrained by the police, three had been hog-tied⁹ and two hand-cuffed. In none of the cases a mechanism of death had been identified in the autopsy, and their blood cocaine levels were below lethal limits. As the mechanism of death was unclear and the

⁸ The discussion is complicated by the additional issue that idiopathic human variability is potentially explained away by simply describing the corresponding cases as instances of a supposed condition called ‘ExDS’. But this is not our main concern here, because such idiopathic variability—even if contributing to explaining what happens in these cases—would not be exculpatory (*Galen, 2004*). Thanks to an anonymous referee for bringing up this point.

⁹ Hog-tying refers to restraining a person by tying their hands and feet together behind their back.

autopsy findings did not indicate any known cause of death, Wetli and Fishbain suggested that an independent, previously unknown, pathophysiological condition could explain the deaths. They thus assigned the deaths to what they described as “excited delirium” resulting from fatal cocaine intoxication. They warned that “police and emergency paramedical personnel should be aware of the potential for sudden death in association with excited delirium” (*Wetli & Fishbain, 1985, p. 879*).

It is noteworthy that while “excited delirium” was used in a descriptive sense in the original article by *Wetli and Fishbain (1985)*, it was soon used as a term to denote a cause of death in both the forensic medicine and the emergency medicine literature (*da Silva Bhatia et al., 2022*).¹⁰ In other words, the term has since then been thought to refer to an independent pathophysiological phenomenon, not only to describe a delirious state of a particular kind. In 1985, Charles Wetli himself determined “Excited Delirium” as the cause of death of more than 12 women, suspected sex workers, who had died in Florida (*Kurmelovs, 2021*). All of these women were Black, and Wetli made the conjecture that their deaths might be connected to the color of their skin: he hypothesised that consuming even small amounts of cocaine could be lethal to people with a certain blood type, a type that is more common among Black people (*Walker and Dewar (1988)*, cited in *da Silva Bhatia et al., 2022*). In an interview of *Miami News*, Wetli infamously stated that “[f]or some reason the male of the species becomes psychotic and the female of the species dies in relation to sex” (*Walker and Dewar (1988)*, cited in *da Silva Bhatia et al., 2022*). But these diagnoses of “Excited Delirium” turned out to be mistaken, as in 1992 it was announced that a serial killer was responsible for the deaths of the women (*Kurmelovs, 2021*). When the bodies were exhumed and re-examined, signs of asphyxia were found (*Garcia-Roberts, 2010*). Despite this, the use of “Excited Delirium” as a cause of death became more common in the US-American forensic pathology in the following years (*McGuinness & Lipsedge, 2022*).

The term “Excited Delirium Syndrome” was introduced by Theresa and Vincent DiMaio in their book “Excited Delirium. Cause of Death and Prevention” (2006), which was not peer reviewed. DiMaio and DiMaio review the history of the condition, assess alternative explanations for deaths assigned to ExDS, and provide hypotheses concerning mechanisms explaining the deaths. In their discussion, excited delirium is not only a description of an individual’s erratic behaviour but also a pathophysiological phenomenon and a potential cause of death. According to *Szep et al. (2017)* and *McGuinness and Lipsedge (2022)*, this book was also widely distributed to medical examiners and police departments with the intention to raise awareness of the claimed condition.

To sum up, the notion of ExDS as an independent pathophysiological phenomenon has largely been established with reference to preceding cases that were taken to exhibit characteristics assumed to be associated with the ExDS diagnosis. However, many of the historical cases that have served as precedent for the ExDS hypothesis were later explained by alternative factors. Yet this has not prevented the further spread of the ExDS hypothesis.

2.2. Excluding competing explanations

A second argumentative strategy employed by proponents of the ExDS hypothesis is to deny alternative explanations for death in supposed cases of ExDS. This argumentative strategy is already present in *Wetli and Fishbain’s* original 1985 article introducing the concept of Excited Delirium: *Wetli and Fishbain* reasoned that a previously unknown pathophysiological phenomenon could explain the deaths as the

¹⁰ The term delirium is commonly used in medicine, referring to transient states including, e.g., changes in the level of consciousness and cognitive functioning. However, ‘excited delirium’ became to denote an independent condition with a clinical picture that differs from that of delirium (e.g., *McGuinness & Lipsedge, 2022*).

autopsies had not revealed a specific mechanism of death.

More recent discussions of the ExDS diagnosis are primarily concerned with the competing diagnosis of asphyxia. DiMaio and DiMaio (2006, 35), for example, argue that the two most important competing explanations for claimed ExDS deaths are that they are caused by either positional/restraint asphyxia (e.g., compressive force on abdomen or posterior thorax restricting respiration) or neck holds. The role of these competing diagnoses is particularly important because, just as ExDS, asphyxia often lacks clear signs to be discovered in an autopsy (Strömmer et al., 2020).

The underlying reasoning seems to be framed in terms of what has been described as a Holmesian inference (Bird, 2010)¹¹: (1) the fact that an individual died has an explanation; (2) the ExDS hypothesis and the asphyxia hypothesis are the only hypotheses that could explain the individual's death; (3) the asphyxia hypothesis has been falsified; therefore (4) the ExDS hypothesis explains the individual's death.

We take the Holmesian inference to be a reconstruction of how some proponents of ExDS frame the argument. This framing is, of course, problematic because it *assumes* that a syndrome like ExDS can be a potential cause. But in the current discussion this is exactly what is at stake. Still, there are additional difficulties with this argumentative strategy.

The legitimacy of the Holmesian inference crucially depends on the implausibility of all alternative explanations. According to DiMaio and DiMaio (2006, 36), the hypothesis that positional or restraint asphyxia could be the cause of death in cases assigned to ExDS is shown to be false by studies conducted by Chan and colleagues. In their 1997 laboratory study on 15 healthy volunteers, “the restraint position [hands and feet taped close together behind the subject's back] resulted in a restrictive pulmonary function pattern but did not result in clinically relevant changes in oxygenation or ventilation” (Chan et al., 1997, p. 578). Consequently, they “suggest that factors other than body positioning are more important determinants for the sudden, unexpected deaths that occur in individuals who are placed in the restraint position” (Chan et al., 1997, p. 585).

In a 2004 study, Chan and colleagues assessed the additional effect of weight placed on an individual's back during restraint. They evaluated the respiratory function of 10 healthy subjects, in response to the application of weights of 25 and 50 lbs on their backs when they were in a restrained (hog-tied) position. They found that restrained position “with and without 25 and 50 lbs of weight force resulted in a restrictive pulmonary function pattern but [there was] no evidence of hypoxia or hypoventilation” (Chan et al., 2004, p. 185). Discussing the results of Chan et al.'s studies, DiMaio and DiMaio conclude that “there is ... no proof that the amount of force placed on individuals by kneeling on them or lying across their bodies compromises respiration” (DiMaio & DiMaio, 2006, 36–37).

However, the asphyxia hypothesis is far from being falsified, as there are both experimental studies and case reports contradicting the Chan et al. studies. Lethal asphyxia resulting from restraint had been discussed as a potential cause of death already in the early 1980s (Reay & Eisele, 1982). After the publication of the Wetli and Fishbain (1985) paper, several studies examining the physiological effects of restraint techniques used by the police were conducted to test the hypothesis. For example, Reay et al. (1988) conducted a laboratory study in which they measured the effects of positional restraint (“prone, handcuffed, and ‘hog-tied’”) on heart rate and peripheral oxygen saturation. According to the authors, positional restraint had significant effects that “should be considered when investigating deaths in persons who were handcuffed in the prone position” (Reay et al., 1988, p. 18). Moreover, several case reports of individuals who had died while restrained were published (e.g. Reay et al., 1992; O'Halloran & Lewman, 1993; O'Halloran & Frank, 2000). In these studies, the deaths were associated with the position

and/or restrained status of the individuals. The studies suggested that death can be caused by compromised ventilation due to the position of the body and/or weight placed on the upper torso. Moreover, the validity of the studies conducted by Chan and colleagues has been questioned. We shall discuss this issue in more detail in section 3.1.

Holmesian inference also requires that one has an overview of all possible explanations—premise (2). But that may be challenged in the context of ExDS as well: recent studies show that prone restraint is associated with decreased cardiac output or ventilation that can lead to metabolic acidosis. In these cases the death can be a result of restraint-related “cardiac arrest secondary to metabolic acidosis compounded by inadequate ventilation and reduced [cardiac output]” (Steinberg, 2021, p. 1). In other words, even if asphyxia was not the cause of death in these cases, the deaths would not have happened without restraint. Recent statistical studies indeed show that an overwhelming majority of reported instances of death through purported ExDS are associated with restraint in police custody. For example, according to Strömmer et al. (2020), “there is no evidence to support ExDS as a cause of death in the absence of restraint” (680), suggesting that a diagnosis of ExDS “should be considered an artifact of, rather than an explanation for the death” (681).

In summary, two argumentative strategies have been employed to push the hypothesis that ExDS is a potentially fatal condition: precedent and lack of alternative explanation. These argumentative strategies may well be legitimate ways of justifying the use of a new diagnosis. Yet in the context of ExDS both argumentative strategies have been severely challenged or even debunked. Deaths that were initially attributed to ExDS were shown to be caused differently. For instance, many of the individuals examined by Wetli were shown to be victims of a serial killer (Kurmelovs, 2021). Moreover, an overwhelming majority of reported instances of death through purported ExDS have been associated with restraint in police custody. While research results on the exact effect of restraint remain contested, asphyxia is an important competing explanation in purported cases of ExDS.

3. The epistemic conditions of ExDS

If the key argumentative strategies in support of the ExDS diagnosis have been challenged or even debunked, why is the diagnosis still being employed at all? Previous analyses, e.g., by Physicians for Human Rights (da Silva Bhatia et al., 2022), specifically look at the political and racist circumstances of the ExDS diagnosis. In our analysis, we agree that these factors play an important role in explaining the ExDS hypotheses. However, we approach the practices of forensic medicine as primarily epistemic activities, and focus our analysis on the epistemic shortcomings. Part of the answer why ExDS is being employed, we argue in what follows, has to do with the specific epistemic conditions in cause-of-death inquiry in ExDS cases.

Our analysis takes as a starting point the way in which philosophers of science have discussed the mediating role of background assumptions in bridging the gap between data, evidence, and hypothesis. Longino, for example, argues that “what determines whether or not someone will take some fact or alleged fact, *x*, as evidence for some hypothesis, *h*, is not a natural (for example, causal) relation between the state of affairs *x* and that described by *h*, but are other beliefs that person has concerning the evidential connection between *x* and *h*” (1990, 41). An important consequence of this is that two persons who are interested in evaluating the same hypothesis and are presented with the same facts may come to different judgments of evidentiary support, depending on their potentially diverging background beliefs.

Our analysis will proceed in three stages. First, we show that the practitioners' ‘good sense’ and background assumptions may step in when evidence leaves causal hypotheses underdetermined. Such problems of underdetermination are specifically salient in supposed instances of ExDS (section 3.1). Second, we will address how such assumptions may have an impact on what comes to count as evidence in

¹¹ Bird (2010, 350) relates this to Conan Doyle's dictum “Eliminate the impossible, and whatever remains, however improbable, must be the truth.”

the first place. Again, this is particularly problematic in supposed cases of ExDS because the evidence is elusive (section 3.2). Third, we will have a closer look at the social and institutional context in which ExDS is used as a cause of death. We argue that the way in which shared background assumptions enable inferences in forensic medicine cannot be understood without considering its specific social and institutional context. This, again, is particularly problematic in supposed cases of ExDS (section 3.3).

3.1. Underdetermination and causal hypothesis

In the forensic medicine literature, it is an acknowledged problem that autopsy findings can be insufficient to establish a cause of death (such as in the cases of advanced decomposition) or can point towards multiple possible causes (Davison & Leadbeater, 1996; Meilia et al., 2020). In all cases, any findings have to be interpreted in light of existing pathophysiological knowledge, findings from the scene where the body was found, the medical history of the deceased individual, and what is known about their life and mental state before the passing (Gee, 1995). For instance, in order to determine if an individual died of alcohol poisoning, information about their drinking habits is needed: it is not clear when high levels of alcohol should be determined as fatal because individuals with a long history of alcohol abuse can tolerate considerably higher levels of alcohol than the general population (Davison & Leadbeater, 1996).

Here we shall address these issues as being related to problems of underdetermination. There are different interpretations of the underdetermination thesis (see, e.g., Biddle, 2013; Turnbull, 2018) but for our purposes contrastive underdetermination is most relevant. In such cases the same body of evidence supports two competing hypotheses to the same degree. If there is a situation of underdetermination of an hypothesis by evidence, one can ask, what factors decide the inquirer's acceptance of the hypothesis? Duhem famously referred to the inquirer's "good sense", a notion that has recently attracted renewed interest, especially in the philosophy of science (Ivanova, 2010; Shaw, 2020). But the contemporary debate in philosophy of science is particularly concerned with the role of various background assumptions influencing choices between hypotheses in such contexts and beyond (Brown, 2013; Bueter, 2015; ChoGlueck, 2018; Elliott, 2011, 2022; Intemann, 2005).

If such forms of underdetermination are a general feature of inquiry,¹² then one should expect that it also affects forensic medicine. So, first, one may expect that whether a particular cause-of-death hypothesis is to be accepted, is at least sometimes underdetermined by the available evidence. This would require the expert's 'good sense' in order to reach a conclusion. This is an important entry point for various background assumptions that the forensic practitioner subscribes to. In particular, it may happen that two experts subscribing to different sets of background assumptions, for example, regarding the prevalence of a disease in the population the deceased belongs to, are confronted with the same evidence for a cause-of-death hypothesis, but they disagree as to whether this hypothesis is to be accepted on that basis or not.

What kinds of hypotheses are at stake in cause-of-death inquiry? Russo and Williamson (2011) argue that in order to establish a causal claim, one typically needs both evidence of a mechanism and of difference-making. A mechanism explains how an outcome is produced. For example, when a person is killed by a gunshot to the head, we have a clear understanding of the damage that the bullet has inflicted on the victim's brain. Difference-making is concerned with counterfactual questions, that is, considerations about what would have happened if the supposed cause of death had not occurred.

The first complication with supposed cases of ExDS is that even the

¹² Even though the literature has focused on underdetermination in scientific research, underdetermination poses challenges to inquiry in general see, e.g. Longino (1990, chap. 3) for discussion.

proponents of the diagnosis admit that the mechanism of death is not known, i.e., that there is no mechanistic understanding of the physiological derangement that leads to death. As compared to cases that involve shooting or stabbing, the only remaining kind of evidence is that of difference-making.

So, the evaluation of causal claims in ExDS cases more strongly depends on assessing relevant counterfactual conditionals: what would have happened in the current scenario if there had been a difference regarding the presumed cause?¹³ To evaluate such a counterfactual conditional, experts need to make hypotheses about what would have happened in the relevant counterfactual scenarios. In cause-of-death inquiry, these hypotheses usually cannot be tested directly. Because forensic medical investigation is always retrospective, randomised controlled trials and other methods typically thought to produce high-quality evidence about counterfactual conditions are not possible (e.g. Meilia et al., 2020). Instead, experts need to consult the evidence available from scenarios that can be realised in the lab or that are available from case reports. But this evidence is often not sufficient to decide between competing hypotheses about the counterfactual scenario. The evidence gained from the actual scenario leaves hypotheses about the counterfactual scenario underdetermined.

Such problems of underdetermination are particularly serious in supposed instances of ExDS. They are encountered both at the level of general causal claims and at the level of claims concerning the actual cause of death in individual instances. First, consider general causation. The relevance of the asphyxia hypothesis in purported ExDS cases depends on counterfactual claims: what would happen if a certain amount of weight were to be applied to test subjects? This question cannot be answered directly, because test subjects may not be harmed, and the stress situation cannot be simulated under laboratory conditions. Instead, experts have to consult the limited evidence gathered from conditions that can actually be realised in the laboratory, such as the results of the Chan et al. (2004) study. This study suggests that there are no changes in vital parameters as a result from applying limited amounts of weight.

But even if one does not question the methodology of these studies the available evidence leaves the evaluation of relevant hypotheses regarding the counterfactual scenario underdetermined. One could argue (H1) that in the relevant counterfactual scenario test subjects behave in the same way as in the observed laboratory conditions and that restraint positions continue to be harmless. Alternatively, one could argue (H2) that if larger amounts of weight are applied or if restraint positions are applied under realistic conditions, then they are potentially lethal. In either case the hypothesis will have to be backed up by additional assumptions. Hypothesis H1 would be supported by the assumption that the trends observed in laboratory conditions continue to hold. Hypothesis H2 would be supported by the opposing assumption that in situations involving various stress factors or larger weights the laboratory trends do not continue to hold.

DiMaio and DiMaio interpret the Chan et al. (2004) studies along the lines of H1, when they take these studies to show that "there is ... no proof that the amount of force placed on individuals by kneeling on them or lying across their bodies compromises respiration" (DiMaio & DiMaio, 2006, 36–37). They do this even though the study explicitly points to relevant limitations, stating that the "amount of weights selected for this study may not reproduce the actual amount of weight force used on individuals during the restraint process" (Chan et al., 2004, p. 188) and clarifying that the study "could not reproduce all conditions encountered in the field setting with such cases", such as

¹³ The relevant causal concept in such cases is that of 'actual causation'. Additional difficulties arise when this concept is applied in situations involving multiple competing causes and potentially diverging normative background assumptions as is sometimes the case in cause-of-death inquiry (Fischer, 2021a; 2021b, 2023).

“trauma, struggle, drug intoxication, and other physiologic and psychologic stresses” (188). Others, e.g., Strömmer et al. (2020), criticise the validity of the studies by Chan and colleagues for assessing the asphyxia hypothesis, suggesting that the experimental results cannot be taken to provide evidence against the asphyxia hypothesis in realistic circumstances.

So far, we have discussed problems of causal inference in the context of general claims regarding the causal role of ExDS and asphyxia. These claims concern the evidence for whether something that is called ExDS *can* be a cause of death in realistic scenarios. Additional challenges arise in the assessment of individual cases, which concern the evidence for whether ExDS *did* cause a specific victim’s death. In order to assess these cases, general causal assumptions need to be combined with facts regarding the individual case (Russo & Williamson, 2011). But, as mentioned, the investigation of individual cases in forensic medicine is always performed in retrospect, and direct observation of the cause of death is not possible (Meilia et al., 2020). Moreover, the relevance of the general evidence or evidence gained from other cases (Ankeny, 2014) for the specific individual will depend on the individual’s characteristics. Such problems typically arise in the context of making forensic epidemiological evidence count for specific cases (Benzi, 2023), especially when legal judgements depend on them (Broadbent, 2016). But the situation is particularly problematic in cases of supposed ExDS because, as stated earlier, such cases often involve complex histories of medical illness or drug abuse. Information about such histories can be highly specific and difficult to generalise. Another important aspect is that there are also characteristics that may lead to a biased evaluation of individual cases. This is particularly important considering the frequent use of racial stereotypes in reports of supposed ExDS cases.

3.2. What counts as evidence?

We have been concerned with situations where the available evidence is not sufficient to decide in favor or against a particular cause-of-death hypothesis. Disagreement about the cause of death, we have argued, partially comes down to disagreement about what would have happened in relevant counterfactual scenarios. This is because the available evidence about what happens in the observed situations to a certain degree leaves open what would have happened in the counterfactual scenario. Even if there is agreement about the actual circumstances, there is room for disagreement about the counterfactual. But disagreement may even go deeper. It may also concern what the actual evidence is in the first place.

Forensic medicine scholars acknowledge that expert disagreement in the field is not unusual (see, e.g., Madea & Rothschild 2010; Meilia et al., 2020). The available data always has to be interpreted in the light of the existing medical and other scientific background knowledge, what is known about the individual in question, as well as the circumstances of the death. As philosophers have argued before (e.g. Longino, 1990; Leonelli and Tempini 2020; Canali, 2020), a general challenge in evidential reasoning is that different judgments and assumptions have an impact on what data is taken to be evidence for. In the context of diagnoses of ExDS this concerns, for instance, the evaluation of HSP70 levels. When elevated HSP70 expression is observed in a brain biopsy of an individual who has died in police custody, should we take this to be evidence for ExDS or simply indicative of a struggle having taken place (cf. Mash et al., 2009; Johnson et al., 2012)? An answer to the question depends on whether we believe ExDS to be a lethal condition in the first place, whether we know that physical force has been used, how reliable we take the biomarker studies to be, and so on.

The lack of standardisation in the field of forensic medicine adds to the issue of practitioners interpreting autopsy findings differently. For example, there is variation in how autopsies are performed and how their results are presented (e.g., National Research Council, 2009). What strategies are used to investigate the body partially depends on what questions the forensic expert sets out to answer, which in turn is

context-dependent and related to the practitioner’s assumptions about similar cases (Saukko & Pollak, 2009). As there is no fixed procedure for how to amalgamate and interpret the available data, practitioners have to rely on their own background assumptions in how to proceed with the inquiry.

An additional challenge is posed by the changes that happen in the body after death. Consequently, the object of inquiry is not exactly the same for two pathologists investigating the same body. Despite conservation techniques, the body may undergo changes that have a significant impact on its evidential value. Moreover, the object of inquiry may change through the process of inquiry: due to the invasive method of autopsy, the second examiner does not have access to exactly the same data as the first one. This raises challenges for the replicability of forensic investigations.

Again, these issues are particularly problematic in the context of ExDS, as is illustrated by the Quinto case.¹⁴ An autopsy commissioned by the Contra Costa County was performed by a coroner two days after Quinto’s death. According to the district attorney’s report (Becton, 2022), the autopsy report identifies “Excited Delirium Syndrome” as the cause of death and it adds more specific information stating that the Excited Delirium Syndrome was “due to Acute Drug intoxication with behaviour disturbances and Arrest Related Death (ARD) with physical exertion” (29). According to the district attorney’s report, the forensic pathologist also noted “the prone position with weight on the back may have played an additional role” (29f).¹⁵

A second autopsy was privately commissioned on behalf of the Quinto family and performed on January 4, 2021, nine days after Quinto’s death. The private autopsy disagrees with the Contra Costa coroner’s report in that it determined the cause of death to be restraint asphyxia. In support of this conclusion, the medical examiner referred to “cerebral injury; petechial hemorrhages to the eyes; and patchy cutaneous petechial hemorrhages to the anterior and lateral neck” (Becton, 2022).

The Contra Costa coroner was subsequently questioned about his views on the privately commissioned report. According to the coroner, the petechial haemorrhages were not observed during the first autopsy. The pathologist stated that petechial haemorrhaging would enhance with the passage of time. Moreover, he suggested that the application of pressure on the body during examination can enhance the presence of such haemorrhages. The pathologist also testified that the discoloration was from lividity, the pooling of blood towards dependent areas of the body postmortem (Becton, 2022).

Whether and to what degree changes to the deceased’s body occurred in the Quinto case is not evident from the district attorney’s report. Nonetheless, it is clear that the mere possibility of changes to the body gives rise to uncertainties in the procedure. The Contra Costa coroner explains the discolorations observed by the privately commissioned pathologist as a result of postmortem changes to the victim’s body that result simply from the time that has passed between the first

¹⁴ We do not claim that all problems encountered in the Quinto case generalise to all instances of supposed ExDS. Yet, we assume that some of the issues are representative of the kinds of structural problems associated with such cases, such as the power structure, information channels, and the specific kind of stress situation.

¹⁵ Note that additional difficulties arise from imprecision in causal terminology. The report suggests that it is the interplay of multiple factors that gave rise to a supposed episode of ExDS. But the expression “due to” leaves unclear what the causal roles of the individual factors are. Was the drug intoxication with behaviour disturbances sufficient for the fatal state of ExDS? Was physical exertion sufficient? Or were both factors necessary? Presumably these factors contributed to different degrees. So, which of the factors contributed more? Similar problems of imprecision arise from the pathologist’s claim that pressure on the decedent’s back “may have played an additional role”. It seems that reducing the results of the pathologist’s examination to just the statement that ExDS is the cause of death is an undue simplification.

and the second autopsy. Moreover, the Contra Costa coroner suggests that the discolorations may be a result of the privately commissioned pathologist's examination of the body, i.e. be an artifact of the previous inquiry. Again, it is not at all clear whether the privately commissioned pathologist really had such effects on the body. But the mere possibility of such changes to the deceased's body is an entry point for doubts regarding the factual basis of the produced evidence. This, in turn, undermines the potential of such investigations to help adjudicate in contexts of disagreement.

3.3. Background assumptions and the social context

So far, we have argued that in cause-of-death inquiry, hypotheses are underdetermined by evidence and that there are questions about what counts as evidence in the first place. According to the epistemological framework suggested here, background assumptions play an important role for causal inference in both instances. These background assumptions concern, for instance, the reliability and relevance of certain laboratory studies and witness statements. In what follows, we shall look more closely at how the social and institutional context of forensic medicine influences the emergence and circulation of such background assumptions, specifically in cases of supposed ExDS. More precisely, we will look at (1) the institutional dependence of forensic medicine, (2) the epistemic dependence of forensic medicine, and (3) the evaluation of expert testimony. Note that we do not claim that the social context fully explains or even determines such background assumptions. Yet, we take the impact of the social context on the background assumptions to be an important mechanism mediating the kinds of institutional, political, and racist factors pointed out by earlier discussions of the ExDS diagnosis (e.g., Longino, 2002).

(1) *Institutional Dependence.* A salient factor to consider when analysing the epistemic conditions of ExDS diagnoses is that forensic medicine is “a law-medicine hybrid” (Timmermans, 2007, p. 155). Unlike other medical fields, forensic medicine does not aim at promoting health or preventing disease. Instead, its goal is to provide evidence for the legal system. The main task is establishing the cause and manner of death in cases where the death has happened under unclear circumstances (Meilia et al., 2020). The closeness to the legal system and law enforcement is particularly evident in the U.S., where forensic medical facilities are often in-house, i.e., under the administrative control of law enforcement agencies (Luzi et al., 2013).¹⁶ The in-house status of forensic medicine facilities means that they have less independence than in some other countries, where forensic medicine is practised at academic or healthcare institutions independent of law enforcement agencies (National Research Council, 2009; United Nations, 2014).

While the limited independence of forensic medicine has been said to pose a general threat to its impartiality (e.g., National Research Council, 2009), the situation is particularly problematic in the case of ExDS. This is because the most debated instances of ExDS are those that involve law enforcement. When the experts responsible for collecting and analysing the evidence relevant for determining the cause of death have ties to the police, there is the danger of conscious and unconscious biases affecting their judgement. For instance, Luzi et al. (2013, p. 84) worry that “forensic pathologist may be pressured to craft opinions that favor the law enforcement agency's investigation or to not cooperate with defense attorneys”. The situation is exacerbated by the fact that in the U.S., forensic laboratories responsible for producing analyses that help forensic medical experts interpret autopsy findings are also often closely connected to police departments (Bernstein, 2008). According to

Bernstein (2008), unconscious biases of forensic experts working in government crime labs pose a particularly worrisome challenge to the impartiality of expert testimony in the U.S. judicial system.¹⁷ The 2009 report on the state of forensic science in the U.S. explicitly mentioned police shootings and police-encounter deaths as examples of cases requiring investigation in which the forensic medical experts are independent of law enforcement (National Research Council, 2009).¹⁸

(2) *Epistemic Dependence.* In addition to being institutionally connected to law enforcement agencies, forensic medical practitioners are also dependent on information provided by the law enforcement. This is because, as mentioned above, the findings from autopsy alone often are inconclusive or do not help to determine the cause of death. In these cases, statements from law enforcement officers and other witnesses are used for inferring what could have caused the death. For example, in the absence of police body camera recordings or external witnesses, the reports from police officers are central when a forensic medical examiner investigates the possible cause of death that has happened during a physical confrontation with the police (see, e.g., Kunz et al., 2021)

The epistemic dependence of forensic medicine on law enforcement is particularly problematic in supposed cases of ExDS because in such cases police officers are potentially responsible for the harm contributing to the death. For example, information about whether restraint was used and about the force used for restraining is needed for interpreting the autopsy findings. Statements from police officers have thus either worked as evidence or informed background assumptions that have been particularly relevant in the development of ExDS and in individual cases where it is considered a cause of death.

The Quinto case illustrates such problems associated with witness reports. According to the district attorney's report, the family stated that police were either sitting or kneeling on Quinto's back. In a ‘fact sheet’ accessible through the family's website (<https://justiceforangelo.carrd.co/>), however, the family states that “[t]hroughout the duration of the prone restraint, an officer maintained a position on the back of Angelo's neck.” In this document the family also states that “[d]uring at least the last four-and-a-half-minutes of this restraint, Angelo was completely unresponsive.” These statements are in conflict with the officers' admitting to only kneeling on one of Quinto's shoulders, as reported by the Contra Costa district attorney (Becton, 2022).

In addition to epistemic dependence on law enforcement, which is particularly relevant regarding the specifics of the individual case, another type of dependence is salient to the case at hand. As discussed above, the interpretation of evidence in the search for the cause of death of an individual partially depends on general assumptions concerning, for example, the prevalence of diseases, pharmacological knowledge, and pathophysiological knowledge (e.g., Russo & Williamson, 2011; Meilia et al., 2018). In most cases, the background knowledge (considering, for example, the epidemiology of diseases or lethality rate of injuries) that bridges the gap between autopsy findings and a hypothesis about the cause of death is widely shared in the medical community. However, in the case of ExDS, information about the condition has been actively distributed to the forensic medicine community (McGuinness & Lipsedge, 2022; Szep et al., 2017), even though the existence of ExDS as a lethal condition is widely questioned in other medical fields. For example, the distribution of the DiMaio and DiMaio's book and other ExDS-related material to medical examiners and representatives of

¹⁶ Focusing on the U.S. context is relevant because the ExDS diagnosis emerged and is mostly used as a cause of death in the U.S.

¹⁷ As an anonymous reviewer pointed out, the context of law enforcement is currently highly politicized in the U.S. This may further pressure forensic experts to pick a side in death in custody cases.

¹⁸ The report (National Research Council, 2009) raised general concerns about the quality of forensic science and the use of forensic evidence in the US legal system. The report discusses lack of quality control and resources (e.g., equipment and sufficient facilities) in forensic medicine, inadequate expertise and training of the staff, as well as the lack of collaboration between academic pathologists and forensic medical experts.

police departments likely helped to (mis-)inform experts about the condition as a possible cause of death and spread the view that alternative explanations for the deaths have been shown to be false.

(3) *Evaluation of Expert Testimony.* Another aspect of the social context of forensic medicine that is salient to the argument at hand is the evaluation of expert testimony in court and the prevalence of conflicting expert opinions.¹⁹ In the U.S. legal context, scientific evidence to support claims is brought to court by expert witnesses (Bernstein, 2008). Before 1993, the admissibility of scientific claims was determined by the “General acceptance” criterion. This criterion requires that the claims be based on the methods and conclusions generally accepted in the particular discipline (e.g., Mercer, 2008). Here the position of the relevant scientific community was the defining factor in determining what evidence can be admitted to court. In the so-called Daubert reforms, judges were given the gatekeeping function and the responsibility to ensure that expert testimonies admitted to court are based on scientific knowledge. There are a number of factors judges can use for assessing the scientific status of evidence: for example, acceptance in a scientific community, the testability of a theory or a technique, as well as having been subjected to peer review (National Research Council, 2009).

Despite the guidelines for admitting scientific expert testimony, there are disputes about what evidence should be admitted and evaluations of expertise may be contested. It is known that even if the judges have the power to exclude evidence or expert testimony in cases it is challenged by the opposing party, this is rarely done (e.g., Young & Goodman-Delahunty, 2021). Instead of excluding certain evidence in a trial, judges may prefer to let juries evaluate the scientific reliability of witnesses on the basis of cross-examination (Young & Goodman-Delahunty, 2021). There is thus a market for experts who can back up their testimony by referring to peer-reviewed publications and theories accepted in particular scientific fields (e.g., Bernstein, 2008). This, however, may have problematic consequences as it may create incentives for producing publications that fulfill the relevant criteria but have questionable scientific status.²⁰

It is indeed known that even though the Daubert standard was meant to prevent unqualified evidence being put forth in trials, questionable research has still been presented as reliable science. A notable example is bloodstain pattern analysis (National Research Council, 2009). Koolage et al. (2021) argue that being accepted in a community organizing conferences and having been published in a peer-reviewed journal is not sufficient for a method to be scientific. According to Koolage et al. (2021, p. 108), the community of bloodstain pattern analysis is “not only incredibly small but deeply insular”: the individuals belonging to the community have all been trained by the same small group of experts and lack interaction with experts from other disciplines, for example chemistry. This insularity threatens the conditions for critical debate necessary for producing reliable scientific knowledge (Koolage et al., 2021; Longino, 1990).

The general problem of evaluating expertise and scientificity of evidence is especially apparent in ExDS cases. In cases where the admissibility of expert testimony invoking ExDS has been assessed and granted, the ACEP white paper, publications in journals such as *The Journal of Emergency Medicine*, as well as being accepted as a diagnosis in the community of forensic pathologists have been referred to as grounds for admitting such testimony (e.g., *Estate of Dustin Barnwell v Roane County, Tenn., et al.*). The problem here is that, as the reports by Physicians for Human Rights (da Silva Bhatia et al., 2022), Reuters (Szep et al., 2017), and *New York Times* (Valentino-DeVries et al., 2021) have pointed out, the peer-reviewed literature in which the term “excited delirium” became established has been to a large part produced by a small number of individuals. Many of the individuals who have worked as expert witnesses in supposed ExDS cases and who have conducted

research on ExDS, have also been central in establishing ExDS as a diagnosis in the first place. Moreover, many of these individuals have had ties not only to each other but also to law enforcement agencies. For instance, Theodore Chan and Gary Vilke, who conducted many of the studies central to rejecting the asphyxia hypothesis, were among the co-authors of the ACEP white paper and have worked as experts for defence in death-in-custody cases (da Silva Bhatia et al., 2022). Vincent DiMaio has been paid to testify in court. Deborah Mash, who has called Charles Wetli her mentor, has been a central figure in research on biomarkers identifying ExDS. She was also involved in the writing of the ACEP document, and she has been an expert witness in court cases (Szep et al., 2017).²¹

4. Conclusion and outlook

In this paper, we have argued that a better understanding of how the diagnosis of ExDS came about and is used can be acquired by looking at a fundamental tension arising in the discipline of forensic medicine - a tension between the discipline’s goal of providing a neutral evidentiary basis and the discipline’s strong dependence on experts’ background assumptions and values. We have shown that difficulties arise from specific characteristics of causal reasoning in forensic medicine. Further, we have argued that the difficulties are particularly serious in supposed instances of ExDS. First, causal inferences in ExDS cases are strongly based on counterfactual reasoning because even proponents of the diagnosis admit that there is no known mechanism (of death). Moreover, the relevant counterfactual considerations are particularly difficult to evaluate in supposed ExDS cases because of the impossibility of experimentally simulating the conditions of ExDS. Second, there is a question of what counts as evidence in the first place. In supposed ExDS cases, this is particularly pressing due to the elusive character of the evidence. Third, in causal inference regarding ExDS, relevant background assumptions are particularly prone to be negatively affected by the social context of inquiry.

Our analysis has provided a clearer view of the epistemic circumstances that enable a diagnosis that is as problematic as ExDS to have such a far-reaching impact on the evaluation of death-in-custody cases. Causal reasoning in forensic medicine is wide open to practitioners’ background assumptions. Extant studies of the controversy over the ExDS diagnosis (e.g., report by Physicians for Human Rights) are compatible with the prevalence of the diagnosis being a result of intentional misconduct on the side of forensic medicine practitioners and other involved parties such as law enforcement. We agree that such misconduct certainly has played an important role in advancing the problematic ExDS diagnosis. But our analysis shows that there are also more subtle mechanisms in place that would boost the ExDS hypothesis even under circumstances where such individual-level intentions were not manifest.

The current controversy over the ExDS diagnosis is a rich case study for further ethical and epistemological questions that may be addressed in future work. First of all, the specific kinds of problems arising in supposed ExDS may indicate the merits of a more general reflection of the issues arising in the evidentiary practices of forensic medicine we have discussed. Moreover, there are interesting questions regarding the kinds of causal statements involved in the discussion. For example, practices of diagnosing ExDS seem to involve various feedback loops. The general causal claim that ExDS is a potential cause of death has been

²¹ The current case may also be an instance of ‘groupstrapping’ Boyd (2019, 68f). Groupstrapping refers to “the phenomenon that exists between a member of a group and a group itself, in which a member illicitly increases her warrant in a belief by appealing to the testimony of a group, one whose epistemic position towards a proposition she is at least partially responsible for determining”. In these cases, the group’s opinion should not be taken to offer independent support to the individual’s claim (Boyd, 2019; Nguyen, 2019).

¹⁹ We thank an anonymous reviewer for stressing this point.

²⁰ Thanks to an anonymous referee for pointing this out.

taken to be supported by supposed individual instances of ExDS. At the same time, the general belief in the ExDS hypothesis is a prerequisite for ever new diagnoses of ExDS to arise. Moreover, repeated characterizations of ExDS involving an intolerance to pain and ‘superhuman’ strength may contribute to violent reactions of law enforcement, which in turn, may give rise to further supposed instances of ExDS.

Further analysis of the ExDS case may also reveal practices that scholars have previously addressed in the study of (bio)medicalization (Moynihan & Cassels, 2002). Medicalization studies focus on how conditions or phenomena labelled as problematic become to be seen as medical issues, sometimes as a result of intentional information campaigns (e.g., Moynihan & Cassels, 2002; Bueter & Jukola, 2020). Within this framework, the term biomedicalization is used to refer to how the causes of certain problems are perceived to be in the biological makeup and processes within individuals, not in their environment (Midanik, 2004). A similar strategy may have been pursued when the book on ExDS by DiMaio and DiMaio (2006) was distributed to forensic medical practitioners as suggested by Szep et al. (2017) and McGuinness and Lipsedge (2022). Another problematic aspect of biomedicalization in supposed ExDS cases is the (implicit) use of racial categories (Valles, 2016) by police officers responding to supposed cases of ExDS and by forensic medical practitioners in diagnosing ExDS. Examining the ExDS cases further, we believe, may reveal more details about how appeals to evidence are used for framing social or systemic problems as medical issues.

Acknowledgements

We would like to thank Jan Baedke, Dan Brooks, Kristy Claassen, Alejandro Fábregas-Tejeda, Alexandria Poole, Guido Prieto, Helmut Pulte, and Alejandra Petino Zappala for useful discussion and feedback. Saana Jukola gratefully acknowledges financial support from the German Research Foundation (DFG; project no. BA 5808/2-1).

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